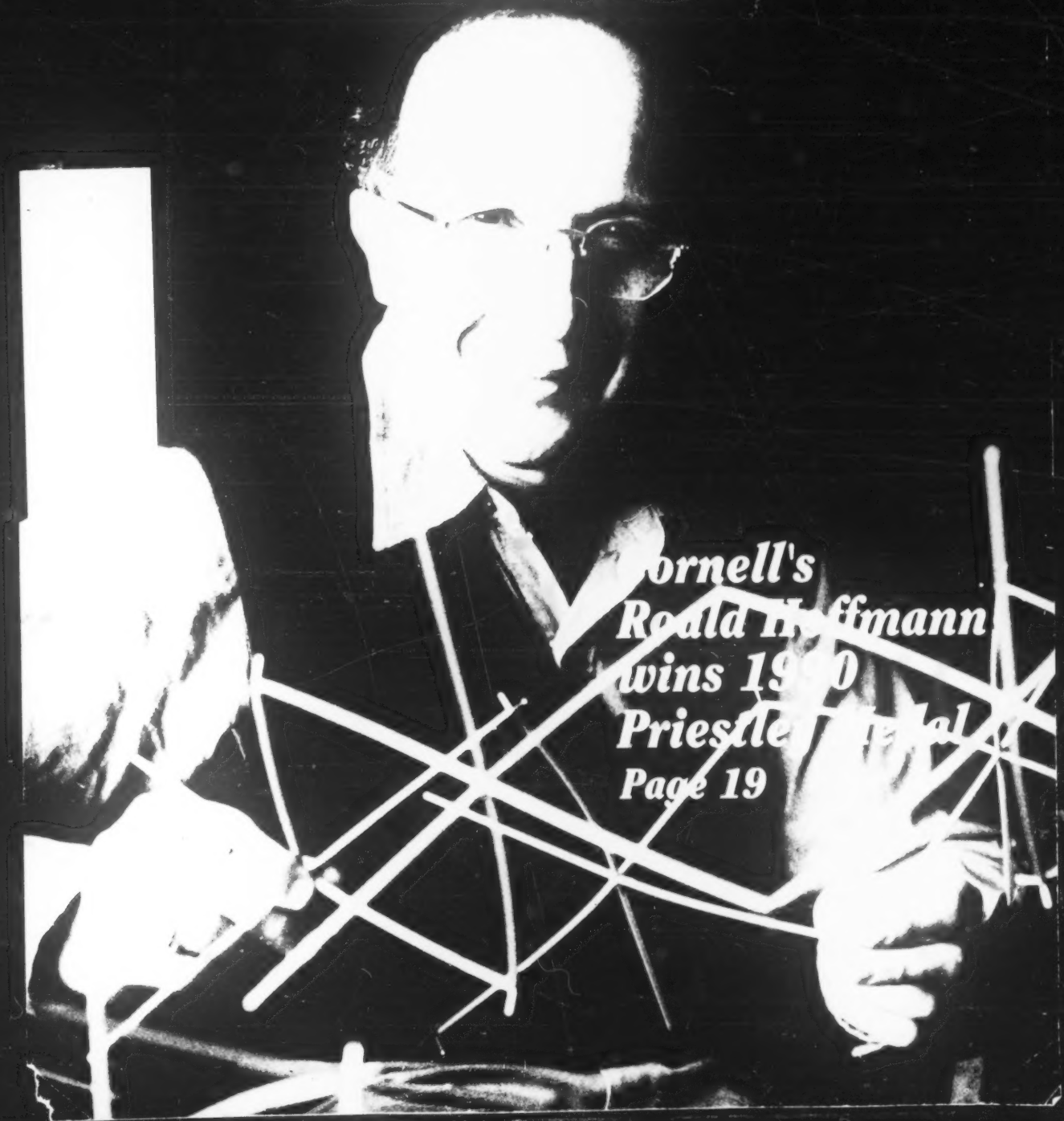
JUNE 5, 1989

CHEMICAL & ENGINEERING

NEWS



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CHEMICAL & ENGINEERING
NEWS

Volume 67, Number 23
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JUNE 5, 1989

News of the Week

■ **Undergrad engineering programs in 1988 record first gains in freshman enrollments since 1982, largely owing to strong increase in minority students.** Page 4

■ **Water-based process for making polyurethane foams without using chlorofluorocarbon blowing agents is now being offered by BASF.** Page 5

■ **Dutch government unveils a tough and costly antipollution program that could strongly affect the chemical industry.** Page 5

■ **Coalition of organizations hits EPA with a suit and petition aimed at revoking rules permitting residues of several pesticides in processed foods.** Page 6

■ **NSF group finds that over half of the investigators whose proposals for interdisciplinary engineering research centers had been rejected ended up benefiting from the experience.** Page 6

Business

Chemical industry is one of the bright spots in a basically dismal picture of U.S. industry drawn in a study by a Massachusetts Institute of Technology group. **Page 9**

Government

Much higher funding of science education by the National Science Foundation and more scientists' time devoted to educational concerns are urged by NSF official Bassam Shakhashiri. **Page 12**

Academia needs greater awareness of hazardous wastes handling and appropriate regulations, concludes EPA in a study of how schools are managing disposal of such wastes. **Page 13**

Science/Technology

Experiments to further define cold fusion continue to baffle researchers gathered at recent fusion workshop. **Page 16**

Twenty finalists will vie for four places on U.S. team for International Chemistry Olympiad. **Page 18**

Books

Autobiography of Francis Crick aims to illustrate special character of biological research and to show research as a human activity. **Page 22**

ACS News

Official reports of ACS committees that met in Dallas during ACS national meeting. **Page 27**

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Priestley Medal

Roald Hoffmann, a professor at Cornell University and winner of ACS's 1990 Priestley Medal, is an avid researcher, poet, essayist, and soon-to-be TV host. Page 19

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LETTERS

Electronic databases

SIR: I have read the letter by Stuart M. Kaback and the CAS reply by Newman M. Bortnik on the distribution of Chemical Abstracts Service's electronic databases (C&EN, Feb. 6, pages 3, 34). The actions taken by CAS to restrict access to its databases are particularly dismal, because much research today is multidisciplinary. I routinely search chemical, medical, and engineering databases.

If the CAS actions become a trend, many database compilers will become vendors, and scientists will find themselves subscribing to separate search services for each database. To comprehend how undesirable this is, imagine this trend applied to distribution of the hardcopy versions of the electronic databases. Research scientists would find themselves going to one library for *Chemical Abstracts*, a second one for *Index Medicus*, and yet a third to consult *Engineering Index*.

Actually, research libraries concentrate abstracts (and journals) in one place, where scientists with wide-ranging minds can gain access to information as quickly as they recognize the need for it. I think electronic databases should retain this efficient concentration.

John H. Cross
Houston

Nuclear fusion

SIR: Here are a couple of thoughts on the fusion confusion. I have worked with hydrogen gas and thin-walled palladium tubes (for the removal of dissolved hydrogen gas from water). The solubility and mobility of hydrogen into and through palladium is mind-boggling.

My first thought is: If the calculation of the amount of heat that is supposed to be generated is based on the number of neutrons measured, perhaps not all of the neutrons being generated escape to be measured, and it would therefore appear that more heat is being generated than the calculations permit. If hydrogen is being generated electrolytically (and is being absorbed into the palladium) for five days before the effect is observed, it has to be more crowded in there than 19 college students stacked into a stand-alone phone booth. The higher the density of atomic nuclei, the greater the chances of neutrons being soaked up and therefore not being measured.

The other thought is to place a palladium tube inside another metal tube, make a bomb out of it, then evacuate the bomb, fill it with deuterium gas, and keep it under slight pressure for a few days. If nothing happens, increase the pressure, and if still nothing happens, it kind of tells one that, if the fusion reaction actually occurs, it does so with nascent deuterium. This might lead one to make the electrolysis go at a voltage that is just below that at which gas is evolved, and use a piece of palladium with a lot of surface area. The fusion reaction may also have a critical volume.

Other things I have done during the past 47 years after graduation cause me to heartily urge everyone to clean the palladium with a 600 °C vacuum bake immediately before it is used in any experiment of this nature. This was suggested by someone else, and is an excellent idea. A metal as active as palladium can fill its active sites with garbage, especially if it sits around a laboratory for a while.

Keith R. Whitcomb
El Cajon, Calif.

Polyhedron carbon clusters

SIR: Interest in the large polyhedron carbon clusters (C&EN, Aug. 29, 1988, page 33) has drawn attention to buckminsterfullerene. The generalized geodesic dome shape is familiar to all of us.

I am writing to express an idea in the above area based on the π-metallocenes. If the faces of an appropriate polyhedral cluster possessed aromaticity à la ferrocene, then a rodlike half of ferrocene would extend outward from at least several faces; hence, "pincushionene."

Richard E. Bozak
California State University, Hayward

Future of nuclear power

SIR: Two letters published in your fine magazine (C&EN, Dec. 12, 1988, page 2, and March 6, page 2) by Mike McCormack and Claude R. Hudgens read like forlorn missives from Japanese World War II survivors stuck on remote islands who haven't yet heard about the surrender. Both aim small arms fire at opponents of atomic power as if the nukes were still a viable answer for our energy needs.

Apparently the writers have yet to hear about Three Mile Island, Chernobyl, the cancellation of more than 100 U.S. reactor projects—including Zimmer and Shoreham—and similar cancel-

NSF's Shakhashiri Pushes for More NSF Funding, Time for Education

Target is about $600 million per year—20% of agency's present budget—and 10% of researchers' time devoted to science education

Bassam Z. Shakhashiri, assistant director for science and engineering education at the National Science Foundation, is not shy about asking for what he wants. And what he wants for science education is more money and more time: 20% of NSF's budget and 10% of scientists' time. The twin problems of scientific illiteracy and a shrinking supply of new science professionals cannot be addressed adequately without both of those, he believes.

Since coming to NSF five years ago from the University of Wisconsin, Madison, where he founded the Institute for Chemical Education, Shakhashiri has been relentless in pressing his case within the agency, the White House, and Congress for more funds for science education. He has just as consistently lobbied academic scientists to reserve more time from their research to devote to educational concerns.

But the once seemingly tireless chemist now seems weary and frustrated at times. "I feel for the most part satisfied in what I've accomplished in the past five years," Shakhashiri says. "Is the job done? No. We've made good progress. But I don't want progress. I want advances. As long as I feel I can be effective I will continue here, but I'm eager to go back to classroom teaching."

At NSF, Shakhashiri has presided over the rebuilding of the education directorate, which the Reagan Administration abolished in the spring of 1982. At that time, the agency scrapped all of its education programs except some graduate fellowships and awards, preferring to concentrate on funding basic research in science and education.

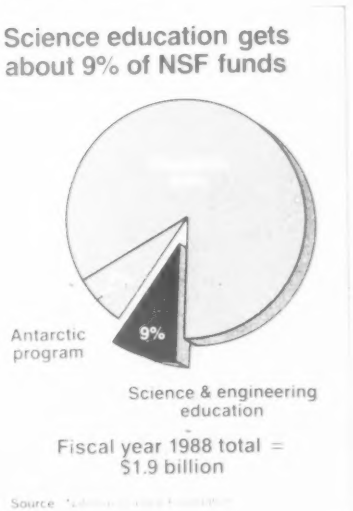
In fall 1983, however, the directorate for science and engineering education was reestablished amid growing fear that the future of the U.S. was threatened by the weak state of U.S. education in general. The directorate received $171 million in fiscal 1989—almost 9% of NSF's budget and about the same proportion it commanded a decade ago. The Administration has requested $190 million for the directorate for fiscal 1990, again about 9% of NSF's total budget.

That is well below the 40% share that education received in its heyday in the late 1950s, however, and well below what Shakhashiri says could be put to good use now. "The NSF level of effort for science education should be about $600 million a year, $300 million for precollege programs, $200 million for college programs, and $100 million for graduate fellowships and traineeships. If the NSF budget doubles over the next several years to about $3 billion altogether, $600 million for education would be 20% of that."

American Chemical Society president Clayton F. Callis supported that $600 million target—a figure suggested by two reports of the National Science Board—in testimony before Congress last month (C&EN, May 22, page 39). "This nation must strengthen and emphasize science education at all levels in order to maintain and improve our competitive position worldwide and to provide the technically literate work force needed in the future," Callis said. Calling the $190 million requested for 1990 insufficient, ACS asks that the education directorate be funded at $231 million next year.

For the past several years, Congress has given more money to the NSF education directorate than the Administration requested. Earlier this spring, Jerry A. Bell—professor of chemistry at Simmons College in Boston, current director of the Institute for Chemical Education, and an NSF education administrator from 1984 to 1986—thanked Congress for its support during a hearing held by the House Committee on Science, Space & Technology's Subcommittee on Science, Research & Technology.

"I assure you that without the help of this Subcommittee and that of the Congressional Committees on Appropriations, the NSF budget for science, engineering, and mathematics education would still be very small," Bell said. "Since 1985 the Administration's requests for science education have displayed a dismal lack of leadership."



C&EN staff photo

Shakhashiri: job not yet done

Pending the passage of the 1990 budget, Shakhashiri has two major programs in the planning stages. They are a state initiative and an urban initiative in science, mathematics, and technology education. "These will be a systematic approach to try to work with state governors, business leaders, and the education community to elevate the level of scientific literacy," he says.

"At the same time, we will work with people in big urban settings to address problems characteristic of those settings, like high dropout rates," Shakhashiri says. "We'll try to get university scientists and scientists from industry to work with the 100 largest school districts. We want a collaborative effort among institutions of higher education, state educational institutions, and the private sector to put in place a sustained set of activities aimed at improving science and math education."

Shakhashiri believes strongly that working scientists should get much more involved in science education issues. "We can't just sit back and let somebody else worry about it," he says. "We want to be sure we have the right human resources available to meet the demands of the 21st century. I'd like to see people from the chemistry department at Columbia University, say, pay some attention to how chemistry is taught in New York City. I could say the same thing about the University of Chicago, or Houston, or UCLA."

The current culture in universities, he thinks, does not place a high enough value on teaching at the college or precollege level. He'd like to see academics devote 10% of their time to educational issues. Many of the programs the NSF education directorate has devised are mechanisms to bring together scientists with educators.

"We have a huge budget deficit and a huge trade deficit," Shakhashiri says. "But we don't have a brain deficit in this country. We need to encourage the talent in this country to pursue careers in science or—for those who choose not to—to at least be tolerant if not supportive of what scientists want to do."

Pamela Zurer

EPA examines schools' handling of toxic waste

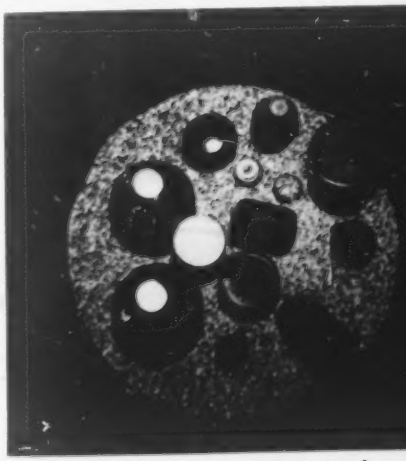
The Environmental Protection Agency, in a just-completed report to Congress on the state of hazardous materials handling at academic institutions, concludes that most problems arise from the institutions' lack of awareness about hazardous wastes and appropriate regulations. Most recommendations focus on increasing that awareness.

Entitled "Report to Congress: Management of Hazardous Wastes from Educational Institutions," the report was ordered in the 1984 amendments to the Resource Conservation & Recovery Act. Congress asked that the report be completed by April 1987, a deadline missed by only two years. EPA emphasizes that the report is only factual in nature, as the agency was not directed by Congress to develop regulatory programs or statutory changes to control wastes in school labs. The report includes an analysis, based on data the agency received from school labs, of the methods available for treatment and disposal of academic hazardous wastes.

EPA estimates that about 30,000 universities, colleges, and high schools in the U.S. generate up to a total of 4000 metric tons of hazardous wastes annually. This is less than 0.01% of the 240 million metric tons of total hazardous wastes estimated to be generated in the U.S. each year. The very small percentage is one of the reasons that this report was requested. When RCRA was being reauthorized, organizations concerned about the rigidity of current rules for disposal of hazardous wastes as they applied to academic labs wanted Congress to set different disposal rules for schools than for industry. The EPA study was a step to get the government to recognize that academic labs are not comparable to industrial labs.

Most of the data EPA relied on to prepare its report was collected under a contract from Tufts University, completed in 1987. The Tufts group made a study of 26 institutions—19 colleges and universities and seven high schools—of various sizes and in different localities. The study looked at what wastes were generated and how they were handled. Other data came from material supplied by the American Chemical Society and from educators at several universities.

A major concern about the EPA study is that the data are relatively old. Since the Tufts data were collected, for instance, major community right-to-know and emergency response legislation have gone into effect. These are included in Title III of the Superfund Amendments & Reauthorization Act of 1986. The recent legislation has heightened



Bulk of lab wastes that can't be treated is placed in lab packs for disposal